ABSTRACT OF THE DISCLOSURE

Fluidic nanotube devices are described in which a hydrophilic, non-carbon nanotube, has its ends fluidly coupled to reservoirs. Source and drain contacts are connected to opposing ends of the nanotube, or within each reservoir near the opening of the nanotube. The passage of molecular species can be sensed by measuring current flow (source-drain, ionic, or combination). The tube interior can be functionalized by joining binding molecules so that different molecular species can be sensed by detecting current changes. The nanotube may be a semiconductor, wherein a tubular transistor is formed. A gate electrode can be attached between source and drain to control current flow and ionic flow. By way of example an electrophoretic array embodiment is described, integrating MEMs switches. A variety of applications are described, such as: nanopores, nanocapillary devices, nanoelectrophoretic, DNA sequence detectors, immunosensors, thermoelectric devices, photonic devices, nanoscale fluidic bioseparators, imaging devices, and so forth.